

Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A method for manufacturing composite membranes for a fuel cell, comprising a step of coating a surface of polymer electrolyte membrane with inorganic thin film, thereby obtaining the composite membrane, wherein inorganic material of the inorganic thin film is one or more selected from the group consisting of silicon oxide (SiO₂), titanium oxide (TiO₂), zirconium oxide (ZrO₂), zirconium phosphate (Zr(HPO₄)₂), zeolite, silicalite, and aluminum oxide (Al₂O₃).

2. (Canceled)

3. (Previously Presented) The method of claim 1, wherein the polymer electrolyte membrane comprises perfluorosulfonic acid membrane; electrolyte membrane made of proton conducting hydrocarbon material; or electrolyte membrane made of proton conducting fluorine material.

4. (Previously Presented) The method of claim 19 wherein the PECVD method uses reactants comprising one or more organic metal compounds comprising aluminum, titanium, silicon, or zirconium, in conjunction with one or more gases selected from the group consisting of oxygen, nitrogen, hydrogen, steam, and argon.

5. (Previously Presented) The method of claim 4 wherein the organic metal

compounds are one or more selected from the group consisting of trimethyl disiloxanes (TMDSO), hexamethyl disiloxane (HMDSO), hexamethyl disilane, tetraethyl orthosilicate (TEOS), tetramethyl orthosilicate, tetrabutyl orthosilicate, tetra-isopropyl orthosilicate, aluminium methoxide, aluminium ethoxide, aluminium butoxide, aluminium isopropoxide, titanium ethoxide, titanium methoxide, titanium butoxide, titanium isopropoxide, zirconium ethoxide, and zirconium butoxide.

6. (Canceled)

7. (Previously Presented) The method of claim 20 wherein said reactive sputtering process is characterized to use a 99 % or higher pure metal target such as Si, SiO₂, SiNH, Al, Zr, or Ti, and to maintain its initial pressure at a high vacuum range of 1.0 10⁻³ torr to 1.0 10⁻⁶ torr.

8. (Previously Presented) The method of claim 19 wherein the PECVD method has a microwave power at the range of 10 watts to 500 watts.

9. (Previously Presented) The method of claim 19 wherein a reaction chamber pressure of the PECVD method is in the range of 1.0 to 1000 millitorr.

10. (Previously Presented) The method of claim 19 wherein an argon pre-treatment electromagnetic wave power of the PECVD method is in the range of 10 watts to 500 watts.

11. (Previously Presented) The method of claim 19 wherein a argon pre-treatment pressure of the PECVD method is in the range of 1.0 to 500 millitorr.

12. (Previously Presented) The method of claim 19 wherein a reaction gas pressure in a chamber of the PECVD method is in the range of 10 to 500 millitorr.

13. (Previously Presented) The method of claim 1 wherein a thickness of the inorganic thin film is in the range of 1.0 to 500 nm.

14. (Previously Presented) The method of claim 1 further comprising a step of coating a surface of the composite membrane with a proton-conducting ionomer solution, after coating the inorganic thin film on the surface of polymer electrolyte membrane, so as to enhance contact with electrodes during manufacturing membrane-electrode assembly.

15. (Withdrawn) A composite polymer electrolyte membrane coated with inorganic thin films for fuel cells manufactured according to claim 1.

16. (Withdrawn) An MEA employing the composite polymer electrolyte membranes coated with inorganic thin films manufactured according to claim 1.

17. (Previously Presented) A method for manufacturing an MEA comprising a step of coating catalyst for electrode directly on the composite manufactured according to claim 1.

18. (Withdrawn) A fuel cell employing the composite polymer electrolyte membranes coated with inorganic thin films or the MEA containing the said composite membrane manufactured according to claim 1.

19. (Currently Amended) The method of claim 1 wherein the A method for manufacturing composite membranes for a fuel cell, comprising a step of coating a surface of polymer electrolyte membrane with inorganic thin film is coated on the surface of the polymer electrolyte membrane using a plasma enhanced chemical vapor deposition (PECVD) method, thereby obtaining the composite membrane, wherein inorganic material of the inorganic thin film is one or more selected from the group consisting of silicon oxide (SiO₂), titanium oxide (TiO₂), zirconium oxide (ZrO₂), zirconium phosphate (Zr(HPO₄)₂), zeolite, silicalite, and aluminum oxide (Al₂O₃).

20. (Currently Amended) The method of claim 1 wherein the A method for manufacturing composite membranes for a fuel cell, comprising a step of coating a surface of polymer electrolyte membrane with inorganic thin film is coated on the surface of the polymer electrolyte membrane using a reactive sputtering method, thereby obtaining the composite membrane, wherein inorganic material of the inorganic thin film is one or more selected from the group consisting of silicon oxide (SiO₂), titanium oxide (TiO₂), zirconium oxide (ZrO₂), zirconium phosphate (Zr(HPO₄)₂), zeolite, silicalite, and aluminum oxide (Al₂O₃).

21. (Previously Presented) The method of claim 20 wherein said reactive sputtering method is characterized to have a microwave power at the range of 10 watts to 500 watts.

22. (Previously Presented) The method of claim 20 wherein the reaction chamber pressure of said reactive sputtering method is in the range of 1.0 to 1000 millitorr.

23. (Previously Presented) The method of claim 20 wherein the argon pre-treatment electromagnetic wave power of said reactive sputtering method is in the range of 10 watts to 500 watts.